50-Chromate Labeling

Protocol: Autologous red blood cells (RBCs) were withdrawn from an arm vein through a short catheter. Outside the body, sodium 50-chromate (50 Cr) was added to the blood sample, briefly mixed and incubated for 15 minutes. During the incubation time the chromate was converted to chromic ion by the addition of 50 mg sterile ascorbic acid. The solution was gently mixed and 10 ml were reinfused into the subject.

Twenty minutes after the labeled RBCs were given to the subject, a blood sample was drawn to measure the initial dilution of labeled RBCs to calculate red blood cell mass (RBCM). Over the next few weeks subsequent blood samples were drawn. Counts of labeled RBCs from those blood samples were used to calculate RBC life span. Other hematological and hormonal parameters measured in the blood samples were erythropoietin, hemoglobin, hematocrit, ferritin, iron, and bilirubin levels.

Dosages of 50 Cr labeled RBCs were given to the subjects on L-35 and R+0. Two other planned 50Cr administration sessions, planned for L-0 and R+16, were canceled. During all other sessions listed, subsequent blood draws were performed.

Table of Sessions Performed

Payload ID	Scheduled Day	Actual Day	Actual Date	Grouped Subjects
Mir 18	L-14	L-35	7 FEB 1995	3 subjects
Mir 18	L-0	canceled		
Mir 18	MD 12	MD 12	25 MAR 1995	3 subjects
Mir 18	MD 22	MD 24	6 APR 1995	3 subjects
Mir 18 (STS-71)	MD 110 (FD 5)	MD 110	1 JUL 1995	3 subjects
Mir 18	R+0	R+0	7 JUL 1995	3 subjects
Mir 18	R+7	R+9	16 JUL1995	3 subjects
Mir 18	R+14	R+26	2 AUG 1995	2 subjects
Mir 18	R+16	canceled		

Urine Collection

Protocol: Urine samples were obtained from all three crewmembers during several 24-hour time periods before, during and after space flight.

Before and after space flight, 24-hour urine pools were collected from each subject, using large beakers for storage inside a refrigerator during the collection period. After the volume was measured, aliquots were sampled and frozen at -20 degrees Celsius until analysis, or the samples were processed fresh.

During space flight, urine was collected void-by-void in the Urine Collection Device, which was part of the Mir Urine Collection Kit. The urine was mixed with a known amount of lithium chloride. The lithium chloride concentration was used to determine the volume of each void. Three syringes of urine were sampled from each void, using three different preservation methods; overall about 10-12 ml urine. The first syringe was treated with the preservative thymol, the second one with thimerosal. Both samples were stored under ambient conditions. The third urine sample collected from each void was frozen at -20 degrees Celsius when freezer space was available.

During the Mir 18 mission the EuroMir freezer failed, compromising the quality of the frozen urine samples. Following the shutdown of the EuroMir freezer the frozen urine samples were transferred to the Mir refrigerator (+4 degrees Celsius) which apparently preserved some of the analytes. The quality of the frozen urine samples was further compromised by the fact that the Automatic Temperature Recorder (ATR) inside the Mir refrigerator was never activated prior to flight, and did not record the storage conditions for the urine samples.

For experiment 2.1.1 “Fluid and Electrolyte Homeostasis,” the following urine analytes were assayed: aldosterone, TH-aldosterone, cortisol, antidiuretic hormone (ADH), IR-atrial natriuretic peptide (ANP), cGMP, catecholamines, melatonin sulfate, sodium, potassium, chloride, calcium, creatinine, osmolality, 16-O oxygen isotope, 18-O oxygen isotope, 3-methylhistidine, epinephrine, norepinephrine, 15N urobilinoid, total urobilinoid, -H hydrogen isotope, and 2-H hydrogen isotope (deuterium).

The following analytes were assayed as part of experiment 2.1.2 "Dynamics of Calcium Metabolism and Bone Tissue": total and isotopic calcium (43 Ca and 46 Ca), pyridinoline cross-links, creatinine, hydroxyproline, hydroxyproline : creatinine ratio, and vitamin D metabolites (calcidiol and calcitriol.)

Table of Sessions Performed				
Payload ID	Scheduled Day	Actual Day	Actual Date	Grouped Subjects
Mir 18	L-120 to L-115	L-150 to L-145	15 OCT to 20 OCT 1994	3 subjects
Mir 18	L-30 to L-25	L-60 to L-55	13 JAN to 18 JAN 1995	3 subjects
Mir 18	L-14 to L-9	L-35 to L-33	7 FEB to 10 FEB 1995	3 subjects
Mir 18	MD 12	MD 12	25 MAR 1995	3 subjects
Mir 18	MD 56	MD 93	14 JUN 1995	1 subject
Mir 18	MD 70	not performed		
Mir 18 (STS-71)	FD 5	MD 110	1 JUL 1995	3 subjects
Mir 18	R+0 to R+7	R+0 to R+6	7 JUL to 13 JUL 1995	3 subjects
Mir 18	R+7 to R+14	R+9 to R+15	16 JUL to 22 JUL 1995	3 subjects
Mir 18	R+ 14	R+75 and R+115	20 SEP and 30 OCT 1995	3 subjects

Food/Fluid/Drug/Exercise Logs

All Mir 18 crewmembers were asked to log their food and fluid items if they could not be scanned with the Bar Code Reader (BCR). Daily exercise and drug intake had to be recorded in the log book as well.

For each day of recording, each crewmember filled out one record. Each record listed the name, date, body weight (measurement), exercise activities, drug(s) and vitamin-mineral supplements taken by the crewmember. A table for food and fluid items featured time, quantity consumed, name of the food item and how it was prepared, and comments.

The quality of the dietary intake data was compromised during the Mir 18 mission by the fact that subjects reportedly did not scan or log all consumed food items. During the postflight data collection period, some consumed food items were not reported.

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Mir 18	MD 2 to MD 6	MD 4 to MD 6	17 MAR to 19 MAR 1995	1 subject
Mir 18	MD 7 to MD 20	MD 7 to MD 17	20 MAR to 30 MAR 1995	3 subjects
Mir 18	not scheduled	MD 18 to MD 20	31 MAR to 2 APR 1995	3 subjects
Mir 18	not scheduled	MD 21 to MD 22	3 APR to 4 APR 1995	1 subject
Mir 18	MD 46 to MD 61	MD 89, MD 93 to MD 98	11 JUN and 14 JUN to 19 JUN 1995	1 subject
Mir 18	MD 64 to MD 75	not performed		
Mir 18	MD 78 to MD 80	not performed		
Mir 18 (STS-71)	FD 5 to FD 11	MD 110 to MD 116	1 JUL to 7 JUL 1995	3 subjects
Mir 18	R+0 to R+7	R+0 to R+6	7 JUL to 13 JUL 1995	3 subjects
Mir 18	R+7 to R+14	R+9 to R+13	16 JUL to 20 JUL 1995	3 subjects
Mir 18	R+14	R+75 and R+115	20 SEP and 30 OCT 1995	3 subjects

Body Mass Measurements

Body mass (or weight) was determined every day of dietary monitoring.

Pre- and postflight, a standard, calibrated weight scale was used to measure body weight. For the weight measurements the crewmembers wore shorts, T-shirt and socks, no shoes.

Inflight body mass measurements were done using the Body Mass Measurement Device (BMMD) flown on board the Mir Space Station.

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Mir 18	MD 3	MD 4 to MD 6	17 MAR to 19 MAR 1995	1 subject
Mir 18	MD 7	MD 7, MD 8 and MD 10	20, 21 and 23 MAR 1995	3 subjects
Mir 18	MD 15	MD 11 to MD 16	24 MAR to 29 MAR 1995	2 subjects
Mir 18	MD 22	MD 23 and MD 24	5 and 6 APR 1995	3 subjects
Mir 18	MD 29	MD 29 and MD 31	11 and 13 APR 1995	2 subjects
Mir 18	MD 36	MD 38	20 APR 1995	3 subjects
Mir 18	MD 43	MD 43	25 APR 1995	3 subjects
Mir 18	MD 50	MD 52	4 MAY 1995	3 subjects
Mir 18	MD 57	MD 58	10 MAY 1995	3 subjects
Mir 18	MD 64	MD 64	16 MAY 1995	3 subjects
Mir 18	MD 71	MD 69	21 MAY 1995	3 subjects
Mir 18	MD 78	MD 76	28 MAY 1995	3 subjects
Mir 18	MD 85	MD 80	1 JUN 1995	3 subjects
Mir 18	MD 92	MD 87	8 JUN 1995	3 subjects
Mir 18	MD 99, MD 100	MD 93, MD 94	14 and 15 JUN 1995	1 subject
Mir 18	MD 101	MD 95	16 JUN 1995	3 subjects
Mir 18	MD 102, MD 103	MD 97, MD 98	18 and 19 JUN 1995	1 subject
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Mir 18	R+0	R+0	7 JUL 1995	3 subjects
Mir 18	R+1	R+1	8 JUL 1995	1 subject
Mir 18	R+5	R+4, R+6	11 JUL 1995	3 subjects
Mir 18	R+7	R+9	16 JUL 1995	3 subjects
Mir 18	not scheduled	R+10	17 JUL 1995	2 subjects
Mir 18	R+11	R+12, R+13	19 and 20 JUL 1995	3 subjects
Mir 18	not scheduled	R+13	20 JUL 1995	1 subject
Mir 18	R+14	R+74, R+75, R+115	19, 20 SEP and 30 OCT 1995	3 subjects

15N Glycine Ingestion—not performed

Protocol: Destruction of red blood cells (RBC) results in a sudden increase of urobilinogen in urine. To identify the source of excreted urobilinogen, labeled nitrogen in form of the stable, non-radioactive nitrogen isotope 15N was ingested by the subjects.

The 15N isotope was administered as 15N Glycine; 1.8 grams of 15N Glycine were contained in each capsule ingested by the subjects. The capsules were part of the Tracer Kit flown on board Mir 18. After ingestion of the capsule, urine samples were collected over the next few hours from each urine void and analyzed for urobilinogen.

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Mir 18	MD 43	MD 43	25 APR 1995	3 subjects
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Mir 18	R+1	R+1	8 JUL 1995	1 subject
Mir 18	R+5	R+4, R+6	11 JUL 1995	3 subjects
Mir 18	R+7	R+9	16 JUL 1995	3 subjects
Mir 18	not scheduled	R+10	17 JUL 1995	2 subjects
Mir 18	R+11	R+12, R+13	19 and 20 JUL 1995	3 subjects
Mir 18	not scheduled	R+13	20 JUL 1995	1 subject
Mir 18	R+14	R+74, R+75, R+115	19, 20 SEP and 30 OCT 1995	3 subjects

15N Glycine Ingestion—not performed

Protocol: Destruction of red blood cells (RBC) results in a sudden increase of urobilinogen in urine. To identify the source of excreted urobilinogen, labeled nitrogen in form of the stable, non-radioactive nitrogen isotope 15N was ingested by the subjects.

The 15N isotope was administered as 15N Glycine; 1.8 grams of 15N Glycine were contained in each capsule ingested by the subjects. The capsules were part of the Tracer Kit flown on board Mir 18. After ingestion of the capsule, urine samples were collected over the next few hours from each urine void and analyzed for urobilinogen.